CASE REPORT

Endodontic and periodontal treatments of a geminated mandibular first premolar

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Abstract

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Aim To describe a rare case of gemination involving a mandibular first premolar.

Summary The complex morphology of geminated teeth renders their endodontic and periodontal management difficult. Root canal and periodontal treatments were performed on a geminated mandibular first premolar with three canals. Clinical examination showed two separated crowns with united roots. Radiographically, two distinct pulp chambers with two joined and a third independent canal were seen. Conventional root canal treatment resulted in complete healing of the apical lesion. However, the occurrence of a vertical fracture led to the extraction of the mesial segment. At the follow-up visit, the distal segment was clinically healthy and continued to satisfy functional demands.

Key learning points

- Failure to diagnose the initial crack along a gemination groove resulted in further propagation and finally complete vertical fracture.
- Owing to the abnormal morphology of the crown and the complexity of the root canal system in geminated teeth, treatment protocols require special attention.
- For asymptomatic cases without aesthetic or orthodontic problems and without associated pathosis, routine review and careful maintenance are required.

Keywords: endodontic and periodontal treatments, gemination, mandibular first premolar, twinning.

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Introduction

Fusion and gemination have been described as results of developmental anomalies of dental tissues. Fusion may be defined as the union of two (or more) adjacent teeth and gemination as an attempt by the tooth bud to divide. Union or division may be total or partial

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and may concern the dentine and/or the enamel or even the pulp. The complete division of a tooth germ is called 'twinning' (Tannenbaum & Alling 1963, Pindborg 1970, Shafer *et al.* 1983, Grover & Lorton 1985, Hülsmann *et al.* 1997). It is often difficult to make a distinction between fused and geminated teeth, especially when the phenomenon is normal or supernumerary (Tannenbaum & Alling 1963, Pindborg 1970, Kelly 1978, Hülsmann *et al.* 1997). The exact aetiology is still unknown, but a genetic predisposition is suggested (Pindborg 1970, Shafer *et al.* 1983, Caliskan 1992).

According to results of epidemiologic studies cited by Schuurs & van Loveren (2000), these anomalies are more prevalent amongst primary teeth (0.6–2.8%) than amongst permanent ones (0.1–1%). But if the primary dentition is affected, there is a higher probability of abnormalities occurring in the subsequent permanent teeth (Tannenbaum & Alling 1963, Pindborg 1970, Whittington & Durward 1996, Schuurs & van Loveren 2000). Fusion is much more prevalent than gemination. The most common location is the incisor region but geminations (or fusions) have been reported in canine, premolar and even molar regions (Pindborg 1970, Grover & Lorton 1985, Duncan & Helpin 1987, Whittington & Durward 1996, Schuurs & van Loveren 2000).

This report concerns the endodontic and periodontal treatments of a geminated mandibular first premolar, which is rarely encountered and seldom reported.

Report

Examination

A 38-year-old white female patient with a non-contributory medical history was referred to the Department of Operative Dentistry complaining of acute continuous pain and intraoral swelling located in the mandibular right region.

Clinical examination showed a geminated first premolar with two independent separated crowns but with united roots (Fig. 1). The second premolar was normal.

The soft tissues were inflamed at the buccal proximal gingival margin of the gemination site where periodontal probing revealed a 10-mm lingual and a 6-mm buccal pocket. A slight swelling with a buccal sinus tract was also noticed adjacent to the apex.

A preoperative radiograph confirmed the incomplete cleavage of the first premolar; two distinct pulp chambers with two joined canals and a third independent canal were observed (Fig. 2). The marginal bony support appeared normal and a radiolucent lesion was

Figure 1 Preoperative clinical appearance of the mandibular first premolar. Note the presence of two separate crowns.

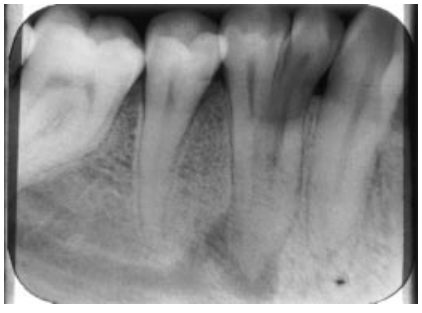

Figure 2 Preoperative radiograph shows the partial cleavage of the mandibular first premolar and a radiolucent lesion around the apices. Two joined mesial root canals (single foramen) and a third independent root canal.

Figure 3 Radiograph with master gutta-percha points placed. Two joined mesial root canals (single foramen) and a third independent root canal.

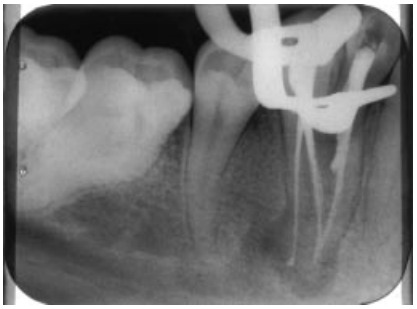

Figure 4 Radiographic examination of the obturation shows a puff of sealer.

visible around the apices. The tooth gave no response to pulp sensitivity tests (thermal and electric). The diagnosis of pulp necrosis and acute apical abscess was made.

Root canal treatment

Two occlusal access cavities were prepared and two distinct pulp chambers with three canal orifices found. The mesial opening was enlarged and investigated for an extra canal. Because no extra canals were detected, size 15 K-files (Dentsply Maillefer, Ballaigues, Switzerland) were inserted into the three orifices and the working lengths established 0.5 mm from the radiographic apex. The canals were instrumented using the crown-down technique (Morgan & Montgomery 1984) to a size 25 master apical file. Rubber dam isolation and copious irrigation with 2.5% sodium hypochlorite solution were used during the preparation. The canal system was dressed with a non-setting calcium hydroxide paste and sealed temporarily with Cavit-W (ESPE, Seefeld, Germany). No antibiotics were administered.

The patient was reviewed 2 weeks later when the tooth was symptom free and the sinus tract and intraoral swelling had disappeared. The non-setting calcium hydroxide was removed, master gutta-percha points placed and a radiograph taken. The radiograph showed a single foramen for the single canal of the mesial segment and the mesial canal of the distal segment. The second canal of the distal segment appeared to be independent (Fig. 3).

The canals were obturated with gutta-percha points and a zinc-oxide eugenol sealer using cold lateral condensation. The radiographic appearance of the root obturation was acceptable and revealed the deep extent of the mesial access opening performed in search of an extra canal (Fig. 4).

One month later the canal orifices were sealed with a light-cured glass ionomer and the crowns restored with composite resin.

Periodontal treatment

After endodontic treatment, the patient was referred to the Department of Periodontology for the management of the periodontal problem. In this case the root surface was also abnormal so it was decided to perform flap surgery under local anaesthesia. A labial flap was raised and a marked groove between the partially cleaved root was noticed (Fig. 5). This abnormal anatomical groove constituted a major plaque retention factor. Tungsten-carbide burs were used to reduce and smooth the area, the flap was repositioned and

Figure 5 Periodontal flap surgery under local anaesthesia. Abnormal anatomical groove.

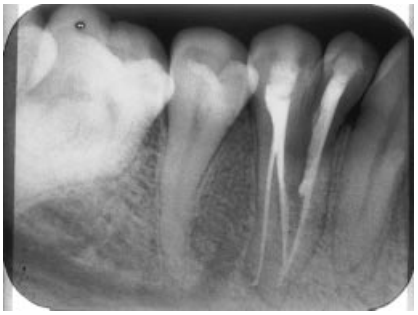

Figure 6 Recall periapical radiograph 12 months later demonstrating disappearance of the radiolucent lesion and the reconstitution of normal bone.

Figure 7 Periapical radiograph of the fractured geminated tooth.

Figure 8 Post-operative (extraction) radiograph of the distal segment of the fractured geminated tooth.

Figure 9 The clinical appearance of the geminated tooth 3 months after extraction of the mesial segment.

sutured. Four months later a lingual flap was raised and the lingual groove reduced and smoothed. The whole procedure was performed in order to achieve optimal periodontal healing.

The postoperative follow-up at 6 and 12 months showed a successful progressive radiographic and clinical healing of the endodontic component (Fig. 6); the root surface correction reduced the plaque accumulation secondary to these abnormal anatomical grooves. The initial localized periodontal pocketing adjacent to the gemination site decreased to measure 6 mm lingually and 3 mm buccally.

One year later the patient returned complaining of constant discomfort located in the area of the geminated tooth over the previous 7–8 days.

On clinical examination the tooth had fractured through the lingual and buccal grooves, resulting in a complete separation of the two segments. A periapical radiograph confirmed a vertical fracture and revealed loss of the alveolar bone between the mesial and distal segments (Fig. 7). Conservation of the mesial segment was considered to have a poor prognosis. Therefore, this segment was extracted and the fractured surface of distal segment smoothed (Fig. 8). The patient returned 1 week later; she was comfortable and the tooth asymptomatic.

At the follow-up visit 3 months later, the gingival tissue surrounding the remaining part of the tooth was remodelling (Fig. 9) and the alveolar socket was remineralizing. The maintained tooth segment continued to satisfy functional demands and no prosthodontic treatment to replace the extracted segment was planned.

Discussion

Geminated and fused teeth are generally symptom-free. Owing to the abnormal morphology of the crown and the internal complexity of the root canal system, restorative, endodontic, periodontic and orthodontic treatment protocols require special attention (Friedman *et al*. 1984, Grover & Lorton 1985, Chaudhry *et al*. 1997, Hülsmann *et al*. 1997).

In the present case both clinical crowns of the affected tooth were caries-free with no restoration and no traumatic history. The aetiology of the pulp infection was initially thought to be the deep lingual and buccal radicular grooves, leading to retrograde pulp infection from the periodontal pockets. This kind of bacterial invasion is often encountered with other developmental anomalies, for example, *dens invaginatus* (dens in dente), *dens evaginatus* and palatogingival groove, and can lead to pulp inflammation, necrosis and even loss of the tooth loss (Rotstein *et al*. 1987, Chen *et al*. 1990, Hülsmann *et al*. 1997). But, since the periodontal pockets did not reach the apical area, this theory was challenged. The later review of this case revealed that the aetiology of the pulp infection could have been due to the presence of an undetected crack along the gemination groove with pulpal involvement. This theory was further supported by the subsequent vertical fracture of the tooth. An excessive access preparation due to the complex internal morphology and the search for an extra canal probably contributed to the propagation of the crack and to the complete fracture.

The long-term prognosis of the present case will depend on the success of the root filling and on the periodontal management of the residual mesial defect. Indeed, continued periodontal treatment comprising instruction in oral hygiene and regular periodontal supportive care, as well as acceptable patient plaque control, will be required to maintain healthy periodontal conditions. Periodic clinical examinations (probing depth, probing attachment levels) and radiographic monitoring must be also planned to assess soft and hard tissues healing.

In this case the conservative endodontic and periodontal treatments were initially considered to be adequate and extraction avoidable. However, subsequent vertical fracture and an area of radiolucency between the fractured surfaces left no other alternative but the extraction of the mesial segment.

Conclusions

Developmentally abnormal teeth require special endodontic and periodontal management.

Failure to diagnose a crack along a gemination groove can allow propagation to complete fracture.

Conventional treatment modalities can be applied to preserve developmentally abnormal teeth and may be successful if intracanal and periodontal infection can be controlled.

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References

Calişkan MK (1992) Traumatic gemination-triple tooth. Survey of the literature and report of a case. *Endodontics and Dental Traumatology* **8**, 130–3.

Chaudhry SI, Sprawson NJ, Howe L, Nairn RI (1997) Dental twinning. *British Dental Journal* **182**, 185–8.

Chen R, Yang J, Chao T (1990) Invaginated tooth associated with periodontal abscess. *Oral Surgery, Oral Medicine and Oral Pathology* **69**, 659.

Duncan WK, Helpin ML (1987) Bilateral fusion and gemination: a literature analysis and case report. *Oral Surgery, Oral Medicine and Oral Pathology* **64**, 82–7.

Friedman S, Mor H, Stabholz A (1984) Case report: endodontic therapy for a fused maxillary lateral incisor. *Journal of Endodontics* **10**, 449–51.

Grover PS, Lorton L (1985) Gemination and twinning in the permanent dentition. *Oral Surgery, Oral Medicine and Oral Pathology* **59**, 313–8.

Hülsmann M, Bahr R, Grohmann U (1997) Hemisection and vital treatment of a fused tooth – literature review and case report. *Endodontics and Dental Traumatology* **13**, 53–8.

Kelly JR (1978) Gemination, fusion or both? *Oral Surgery, Oral Medicine and Oral Pathology* **45**, 655–6.

Morgan LF, Montgomery S (1984) An evaluation of the crown-down pressureless technique. *Journal of Endodontics* **10**, 491–8.

Pindborg JJ (1970) *Pathology of the Hard Tissues*. Copenhagen, Denmark: Munksgaard, 47–58.

Rotstein I, Stabholz A, Heling I, Friedman S (1987) Clinical considerations in the treatment of dens invaginatus. *Endodontics and Dental Traumatology* **3**, 249–54.

Shafer WG, Hine MK, Levy BM (1983) *A Textbook of Oral Pathology*, 4th edn. Philadelphia, USA: W. B. Saunders Company, 38.

Schuur AHB, van Loveren C (2000) Double teeth: review of the literature. *Journal of Dentistry for Children* **67**, 313–25.

Tannenbaum KA, Alling EE (1963) Anomalous tooth development: case reports of gemination and twinning. *Oral Surgery, Oral Medicine and Oral Pathology* **16**, 883–7.

Whittington BR, Durward CS (1996) Survey of anomalies in primary teeth and their correlation with the permanent dentition. *New Zealand Dental Journal* **92**, 4–8.

